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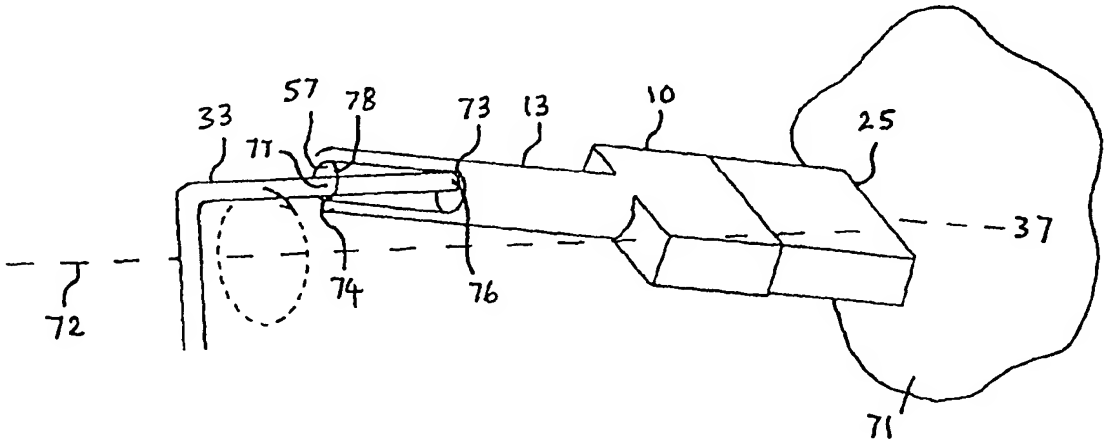

(57) Abstract: A system for rotating a paintbrush that connects handle (31), which may also be connected to an extension pole, to a paintbrush (10) comprises a rotary connection device (36) or silicone tube sections (80, 81) including a first member (56) having an internal cylindrical surface (57) and a second member (33) located within and substantially coaxial with the member (56) and having an external cylindrical surface. One member is attached to the handle (31), and the other to the paintbrush. If the bristles of the brush (10) are place in a painting position against a surface with the axis of the brush extending substantially perpendicular to the surface and the handle (31) is moved with a circular motion substantially coinciding with the axis of the brush, the cylindrical surfaces of the two members will interact and cause the brush to rotate about its axis.

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PAINTBRUSH ROTATION CONTROL SYSTEM

The present invention relates to a method of causing a paintbrush to rotate as required during the course of painting without the need to touch the brush.

A crucial aspect of the operation of a paintbrush is the capacity to rotate it about its axis, which is a line extending from the bristles of the brush through the centre line of the handle, during the course of applying paint. This is done frequently with a hand held brush in order to manage the paint within it and with changes of direction of brush strokes and this is an important factor in the accuracy, speed and general efficiency of the use of a paintbrush.

There are occasions when it would be useful to be able to rotate the brush in the course of painting without the need to touch the brush with the hand as in the case of a brush that is connected to the end of an extension pole and out of reach of the user. When a paint brush is connected to the end of an extension pole much of the useful malleability of the brush is lost due to its fixed position on the end of the pole and the invention can be used to rotate the brush and select different angles of rotation during the course of using the brush on the end of the extension pole without the need to touch the brush by moving the extension pole with a circular action.

Paint brushes often accumulate paint on the handle and the invention can be used to operate the brush including rotating it about its axis as required without the need to touch the brush and thereby avoiding paint getting on the hands. A special brush may be required to rotate continuously in order to produce a special decorative effect and the invention can enable this continuous rotation to take place that would be difficult to achieve with the brush held in the hand.

It is thus an object of the present invention to provide a system that enables the user of the paint brush to rotate the paint brush and stop rotating the paint brush as required in a suitably controllable manner during the course of applying paint by moving the handle of the brush rotation control system with a circular action and it is also an objective of the invention to provide a system that can be connected to the end

of an extension pole that enables the user to rotate the brush by operating the extension pole with a circular action.

Although this system can be used in different ways, it will be described mainly in relation to its optional use on the end of an extension pole as a system that connects a paintbrush to the end of an extension pole that enables the user to rotate the brush as require during the course of applying paint by operating the extension pole with a circular action.

It should be noted that any reference to the use or operation of the extension pole will also apply to the use or operation of the handle of the paint brush rotation system when the system is not connected to an extension pole.

According to the invention a paint brush rotation system is provided that comprises a rotary connection system including a first rotary member having a concave internal cylindrical surface and a second rotary member located within and substantially coaxial with the first rotary member and having a convex cylindrical surface positioned adjacent to the concave cylindrical surface of the first rotary member, means for attaching one of the rotary members to the extension pole, and means for attaching the other rotary member to the paint brush. If the bristles of the paint brush are placed in a painting position against the surface with the axis of the brush extending substantially perpendicular to the surface and the extension pole is moved with a circular motion about an axis substantially coinciding with the axis of the brush, the cylindrical surfaces of the two rotary members will interact and cause the brush to rotate about its axis.

According to one version of the invention, the first rotary member is attached to the paintbrush and the second rotary member is attached to the extension pole. If the extension pole is moved with a circular motion in a clockwise direction this results in the brush rotating about its axis in a clockwise direction and if the extension pole is moved with a circular motion in an anti-clockwise direction this results in the brush

rotating about its axis in an anti-clockwise direction..

In order that the invention may be more readily understood, embodiments of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 shows a known system for connecting a paintbrush to an extension pole,

Figure 2 shows a first embodiment of the invention with the paintbrush attached to the extension pole.

Figure 3 shows in perspective an exploded view of the embodiment of the invention illustrated in Figure 2 in which the handle contains a rotary connection device.

Figure 4 shows in perspective an exploded view of the embodiment of the invention illustrated in Figure 2 in which the handle contains silicone tube sections.

Figure 5 shows an embodiment of the invention which shows an arrangement in which there is one silicone tube section and one expandable collar.

Figure 6 shows an embodiment of the invention illustrating an embodiment of the invention in which one silicone tube section in the handle of the brush.

Figure 7 is a side view in cross section of the rotary connection device illustrated in Figure 3.

Figure 8 is a side view in cross section of the rotary connection system illustrated in Figure 4.

Figure 9 illustrates the relationship between the extension pole, the paintbrush and the wall that is preferably required for operation of a connection system in accordance

with the invention, and

Figures 10 and 11 illustrate diagrammatically how the action of the extension pole causes a rotation of the paintbrush about its axis.

With reference to Figure 1 a known type of connection system for connecting a paint brush 10 to an extension pole 11 comprises a holder 12 for the handle 13 of the paint brush. The holder 12 is hollow with an open end 14 and a closed end 15. The handle 13 of the paint brush can be inserted through the open end 14 into the holder 12 and retained therein by any suitable means. A threaded rod 16 extends from the closed end 15. A rod 17 is attached to one end 18 of the extension pole holder 31which is connected to the extension pole 11. Rod 17 is connected to one end of an intermediate member 19 by threaded member 21 extending through co-operating holes in the rod 17 and the intermediate member 19 and a wing nut 22. This arrangement secures the extension pole 11, the rod 17 and the intermediate member 19 together but allows angular adjustment of the extension pole 11 relative to the intermediate member 19. When the brush 10 is presented to a wall so that paint can be applied to the wall, the brush 10 will not rotate because it is held in a fixed position by the connection system described. During the course of paint application the brush 10 cannot therefore be rotated about its axis to counter the effect of gravity on the paint, to accommodate changes of direction of brush stroke or to fully exploit the malleability of the brush bristles when going into corners etc. and this means that the versatility that the brush has when held in the hand is diminished when it is connected to an extension pole by the above describes type of connection system.

The brush 10 can be removed from the wall and rotated to a required angle by releasing wing nut 25, turning the brush about its axis to the required position and then tightening wing nut 25 again but this is a relatively time consuming and laborious procedure to have to do repeatedly and it interrupts the flow of the work.

With reference to Figure 2, which illustrates a first embodiment of the invention, one end of an extension pole 11, which may be made of metal, is located in hollow paint brush rotation system handle 31 and may be retained therein by engagement of two co-operating threaded members or other suitable means (not illustrated). One end 32 of a Z-shaped rod 33 (which may have any other suitable shape) is attached to the top end 34 of the rotation system handle 31 and the other end 35 of the rod 33 is attached to the handle 13 of a brush 10 by a rotary connection device 36 (described below with reference to Figures 3 and 9) or with silicone tube sections (described below with reference to Figures 4, 5, 6 and 8). The rod 33 is shaped so that the axis 37 of the brush 10, which extends generally perpendicular to the outer ends of the bristles 25 of the brush 10 through the centre line of the handle 13, extends at a desired angle to the axis 38 of the rotation system handle 31 and extension pole 11, for example at about 45 degrees.

A rotary connection device 36 (not illustrated in Figure 2 but described and illustrated below) or a system containing one or more silicone tube sections (also not illustrated in Figure 2 but described and illustrated below) is located in a hole 55 in the end of the handle 13 and allows the brush to rotate about end section 35 of the rod 33. The axis of the rotary connection device 36 or the axis of a system containing one or more silicone tube sections coincides with the axis 37 of the brush 10.

Figure 3 illustrates a perspective and exploded view of an embodiment of the invention illustrated in Figure 2 containing a rotary connection device 36 (commonly used in "mini-rollers" for painting) which is glued into a receiving hole 55 in the brush handle 13. Brush handle 13 may be made of plastic that is formed so as to include the hole 55 or made of wood in which a hole 55 is bored axially into the end of handle 13.

Figure 4 illustrates a perspective and exploded view of an embodiment of the invention containing two silicone tube sections 80 and 81 (which are glued into a

receiving hole 55 in the brush handle 13) and an expandable collar 61 which is positioned between the two silicone tubes 80 and 81. Tube of any other stable material may be used but tubing with a rubbery texture provides better traction between the inside of the tube and the outside of rod 33 and thereby better control of the brush. Expandable collar 61 is given enough room to move freely between tubes 80, 81 and is provided to hold rod 33 in place within the handle of the brush 13.

Receiving hole 55 needs to be deep enough to adequately support brush 10 by rod 33 for the purpose of a smooth and controllable rotation of the brush 10. In a 37mm brush, the receiving hole 55 may be 50mm deep and 10mm in diameter. The silicone tube sections 80 and 81 may be 10mm in diameter to fit the inside of hole 55 and may have an inner diameter (the diameter of the hole 57 in the silicone tube 80, 81) of 6.25mm. Surface of hole 57 provides the necessary contact area for the dynamic interaction between the brush 10 and the rod 33 for the control of the rotation of the brush 10.

Figure 5 illustrates a side view of the brush 10 showing hole 55 that contains an arrangement in which there is one silicone tube section 82 and an expandable collar 61.

Figure 6 illustrates a side view of the brush 10 showing hole 55 that contains an arrangement in which there is one silicone tube section 83 and an end section 84 of hole 55 containing no silicone tube. End section 84 of hole 55 has an internal diameter substantially equal to the internal diameter of silicone tube 83 for example 6.25 mm, thus providing an extension of hole 57 that is formed within the body of the handle 13 beyond silicone tube section 83 that will have direct contact with rod 33 in addition to the contact between rod 33 and interior diameter of silicone tube section 83.

Figure 7 is a side view in cross section of a rotary connection device 36 contained within the handle 13 of the paintbrush 10. The handle 13 is made with a hole 55 of a

suitable diameter to securely receive and hold the connection device 36. The rotary connection device 36 is formed with a cylindrical body 56 of outer diameter substantially equal to the inside diameter of the hole 55. A hole 57 of circular cross section forms a concave cylindrical surface which extends axially through the body 56 and expands into a cylindrical chamber 58. Within the chamber 58 is located a cylindrical collar 61 having an outer diameter less than the inner diameter of the chamber 58 and formed with an axial hole 62. In the course of manufacture of the brush, the connection device 36 is inserted into hole 55 and glued to the inner surface of hole 55 so that there is no relative movement between the connection device 36 and the hole 55. The rod 33 is circular in cross section and its outer surface forms a convex cylindrical surface.

The cylindrical body 56 forms a first rotary member and the rod 33 forms a second rotary member. Together the two rotary members form the rotary connection system 36.

The user connects the paintbrush 10 to the rod 33 by inserting rod 33 through rotary connection device 36 to the point at which it comes to a stop at end of hole 55. Collar 61 is expandable and grips rod 33 to a degree that prevents unwanted slip between rod 33 and collar 61. Rod is tapered or rounded at the end 63 to open collar 61 as it enters at end 62. Collar 61 prevents rod 33 from coming out of the connection device 36 too easily because collar 61 is trapped within chamber 58. Rod 33 is retained firmly within connection device 36 because collar 61 grips rod 33 firmly due to its elastic properties with the result that rod 33 will not come out of connection device 36 without a firm pull because the outer diameter of collar 61 is greater than the diameter of hole 57.

Figure 8 is a side view in cross section of the arrangement in the handle 13 of paintbrush 10 in which a silicone tube arrangement is illustrated in accordance with the illustrations in Figures 4. This configuration with silicone tube sections provides contact points between the outer surface of rod 33 and inner surface of hole 57 that is

essentially the same as the contact points between the outer surface of rod 33 and inner surface of hole 57 in Figure 7.

Rod 33 is inserted in the same manner as in Figure 9 and collar 61 prevents rod 33 from coming out without a firm pull because of the expandable collar 61 cannot escape area 58 between silicone tube sections 80 and 81. The rubbery texture of the silicone tubes 80, 81 create better traction between the rod and inner surface of the silicone tube (than between rod 33 and the inner surface of the rotary connection device 36 in Figure 7 which is made of smooth plastic.) resulting in a greater purchase of the inner surface of the silicone sections 80, 81 tube by rod 33 during the circular motion of the extension pole 11 and thus a more positive control of the rotation of the brush is obtained compared with the use of the rotary connection device 36 as described with reference to Figure 7.

Figure 8 illustrates the operation of the paint brush rotation control system as used with an extension pole 11 and shows the combination of the paint brush 10 and the extension pole 11 with the brush 10 abutting against a wall 71 as when applying paint. In order to rotate the brush 10 about its axis, the user positions the brush 10 so that its axis extends substantially perpendicular to the wall 71, keeps the brush 10 in contact with the wall 71 and moves the extension pole 11 with a circular action to make the brush 10 move in a small circle around an imaginary axis 72 perpendicular to the wall. The axis 72 substantially coincides with the axis 37 of the brush 10. As described below with reference to Figures 10 and 11, this circular movement causes the brush 10 to rotate about its own axis 37. A clockwise circular movement of the extension pole 11 causes the brush 10 to rotate clockwise and an anticlockwise circular movement of the extension pole 11 causes the brush 10 to rotate anticlockwise. The brush 10 can be rotated in this way until the desired angular position is achieved and the user then stops the circular movement of the extension pole 11 and resumes normal brush strokes.

Figures 10 and 11, which should be viewed together, demonstrate the principle by

which the circular movement of the extension pole 11 brings about a rotation of the brush 10 about its axis 37. Figures 10A, 10B and 10C represent diagrammatically in perspective successive positions of the brush 10 during the course of a clockwise rotation of the brush 10 caused by the clockwise circular movement of the extension pole 11.

The axial hole 57 formed within the body 56 of the rotary connection device 56 or by an arrangement of silicone tube sections as illustrated in Figures 4,5,6,8 or 9 is illustrated without a method of retaining rod 33 within the hole 57 as this is not necessary for the purpose of illustrating the principle by which the brush 10 is caused to rotate about its axis because collar 61 is purely to retain rod 33 in hole 57 and has no other purpose.

Rod 33 is positioned within cylindrical hole 57. In an actual embodiment of the invention the diameter of the convex outer cylindrical surface of the rod 33 will be slightly less that the diameter of the concave inner surface of the hole 57. The difference between outer diameter of the rod 33 and the inner diameter of the hole 57 in this illustration is greatly exaggerated for the purpose of illustrating the principle by which the circular motion of the extension pole 11 causes a rotation of the paint brush 10 and therefore the divergence of angle of brush 10 from 45 degrees from the wall (this divergence being the difference between axis 37 and axis 72) caused by the circular movement of the extension pole 11 is greatly exaggerated compared to an actual embodiment of the invention.

In Figures 10A, 10B and 10C, the rod 33 is illustrated as making contact directly with the inner surface of hole 57. Whether this hole is formed with the use of the rotary connection device 36 or silicone tube sections or otherwise formed is not relevant to the illustration as the principle will apply in all cases. An actual embodiment of the invention only needs a small amount of play for the system to work, which may be almost unnoticeable.

In an actual embodiment the outer diameter of the rod 33 may be 6mm in diameter and the inner diameter of the hole 57 may be 6.25mm, although all dimensions are capable of variation.

In order to rotate the brush 10 about its axis 37, the user positions the brush 10 substantially perpendicular to the wall 71 with the tips of the bristles 25 against the wall 71 and moves the extension pole 11 with a circular action that causes the straight end section off rod 33 within the cylindrical hole 57 in the handle 13 of brush 10 to move in a clockwise direction around an imaginary axis 72 which extends perpendicular to the wall 71. Axis 72 is the axis about which extension pole 11 and the rod 33 are moved around whenever this action takes place. The circular movement of rod 33 about axis 72 causes the brush 10 to rotate about its own axis 37 because the connection at contact areas 78 and 76 that take place between the outer surface of rod 33 and the interior surface of the hole 57 cause interior surface of hole 57 and therefore the brush 10 to rotate around the rod 33.

The pressure of the brush 10 against the wall 71 causes a resistance to the movement of the brush 10 which is acted against in the cause of the circular movement of the extension pole 11 about axis 72 resulting in continuously moving contact points within contact areas 78 and 76 between rod 33 and the inner surface of cylindrical hole 57 during the course off the circular movement.

In Figure 10A rod 33 is at a point in its revolution about axis 72 that is above axis 72. The upward force of rod 33 at this point acting against the resistance of the brush 10 against wall 71, causes the upper part of the end (area 76) of the rod 33 to be in contact with the upper part of the inner surface of the hole 57 at point 73 and the part of the rod 33 which is near the opening of the hole 57 is in contact with the lower part of the inner surface of the hole 57 at point 74. In Figure 10B, rod 33 is at a point in its revolution about axis 72 that is to the right hand side of axis 72 and the sideways force of rod 33 causes the contact points 75 and 74 to be located horizontally. In Figure 10C, rod 33 is at a point in its revolution about axis 72 that is below axis 72

resulting in contact points 77 and 75.

Figure 11 (Figures 11A, 11B, 11C) are diagrammatic representations illustrating a cross section of the end of rod 33 positioned within the hole 57 that is either formed within the body of a rotary connection device 36 or that constitutes the interior surface of silicone tube sections depending on which structure is used.

The position of rod 33 within the hole 57 as illustrated in cross section in Figure 11A corresponds to the end contact area 76 of rod 33 (immediately before the rod becomes tapered or rounded (63 in Figure 7) as illustrated in Figure 10A. The position of rod 33 within the hole 57 in Figure 11B corresponds to the end contact area 76 of rod 33 as illustrated in figure 10B. The position of rod 33 within the hole 57 in Figure 11C corresponds to the end contact area 76 of rod 33 within the hole 57 in Figure 10C.

At the point of contact at 73, 74 and 75 in 11A, 11B and 11C respectively which correspond to the points of contact in 10A, 10B and 10C respectively, between rod 33 and inner surface of hole 57, the body 56 of the rotary connection device 36 or the silicone tube section 80 is caused to rotate in the direction of the circular movement of rod 33. This is because when rod 33 progresses in a clockwise direction from the position in Figure 10A and 11A to the position in 10B and 11B and the on to the position in Figures 10C and 11C in a continuous motion, the inner surface of the body 56 in which hole 57 is contained is progressively rotated in a clockwise direction by the action of rod 33, causing the body 56 of the connection device 36 or the silicone tube section 80 and thereby the brush 10, to rotate about axis 37 in a clockwise direction. For the same reason, an anticlockwise circular movement of rod of rod 33 causes the brush 10 to rotate about axis 37 in an anticlockwise direction.

The contact of rod 33 at contact points with the cylindrical surface of hole 57 as rod 33 travels around surface of hole 57 thus causes the body 56 of the rotary connection device 36 or silicone tube 80 and thereby the paint brush 10 to rotate around rod 33 in the manner described above.

The action of the rod 33 at front contact area 77 in Figures 10A, 10B and 10C has the same effect on the inner surface of hole 57 at front area 78 as the rod 33 has on inner surface of hole 57 at the far end 76 in that the circular action of the rod 33 interacts with surface of hole 57 at front area 78 to cause the brush 10 to rotate. The brush 10 is thus supported by rod 33 as it (the brush 10) is caused to rotate about its axis 37 as a result of the transmission of the force from the circular movement of the extension pole 11 at contact areas at both ends (areas 78 and 76) of the section of rod 33 contained within the hole 57.

As rod 33 follows the circular action around axis 72 it makes contact with surface of hole 57 in a progressive manner around the surface of hole 57. As the contact point between rod 33 and surface of hole 57 changes in the course of this action, the point of contact (between rod 33 and hole 57) on the circumference of rod 33 and hole 57 also progressively changes. With a circular action of rod 33 in a clockwise direction , the point of contact that rod 33 makes with hole 57 on the circumference of rod 33 will move around the circumference of rod 33 in a clockwise direction and the point of contact that the surface of hole 57 makes with rod 33 will move around the circumference of hole 57 in a clockwise direction.

Assuming there is a good connection between rod 33 and hole 57 without slip the change of point of contact between the circumference of hole 33 and the circumference of hole 57 will mean that cylindrical body 56 will move around the circumference of rod 33 in such a way that the distance covered of the progressively continuing contact point on surface of hole 57 around the interior surface of the circumference of hole 57 will be equal the distance covered of the progressively continuing exterior contact point around the exterior surface of the circumference of rod 33. Therefore if the circumference of rod 33 is half that of the circumference of hole 57, a 180 degree progression of contact point around rod 33 will correspond to a 90 degree progression of contact point around interior of hole 57 and if there is no slippage between the surfaces of rod 33 and hole 57, the rod 33 will need to do two

180 degree circular motions to cause one 180 degree rotation of cylindrical body 56.

The rate of rotation of cylindrical body 56 around rod 33 in response to circular actions of rod 33 is thus related to the relative sizes rod 33 in relation to hole 57. The greater the difference in size of the rod 33 in relation to the hole 57, the less distance of the circumference of the hole 57 is used to cause the cylindrical body 56 to travel around the circumference of rod 33 to complete a 180 degree rotation and the smaller the difference between the circumference of the rod 33 compared to the circumference of the hole 57 the greater the distance around the circumference of rod 33 that the cylindrical body has to travel in order to complete a 180 degree rotation. Therefore more circular actions of the rod 33 will be required to rotate cylindrical body 56 (and therefore the brush 10) 180 degrees with less difference in size between the rod 33 and hole 57 and fewer circular actions of rod 33 will be required to rotate cylindrical body 56 180 degrees with greater difference between the size of rod 33 and hole 57.

In an embodiment of the invention a degree of slip between rod 33 and interior surface of hole 57 may exist but as the surfaces of rod 33 and hole 57 are even and consistent throughout 180 degrees, the degree of slip is consistent and therefore there is a consistent relationship between the circular action of the extension pole and the rotation of the paint brush 10.

In an embodiment of the invention in which the rod is 6mm in diameter and the interior surface of hole 57 is 6.25mm, it may take in the region of eighteen circular actions of the extension pole 11 to produce one 180 degree rotation of the paint brush 10.

The circular movement of the extension pole 11 will cause the brush 10 to follow the circular movement of the extension pole 11 as well as to rotate about its axis 37. The tips of the bristles 25 of the brush will thus tend to make a circle on the wall. The circle that the brush 10 makes on the wall 71 is minimal and in most painting jobs

there is room for this. The diameter of the circle moved through by the extension pole 11 about axis 72 may be in the region of 30mm to 40mm. The user continues this action until the paintbrush 10 reaches a point in rotation about its own axis 37 that is desired, at which point the user stops the circular movement of the extension pole 11 and resumes normal brush strokes.

The paintbrush rotation control system may be made with a brush 10 of any suitable size with a handle 13 of any design or length provided that it can incorporate a suitable hole 57 in accordance with the principles of the invention. Rod 33 can be of any shape or length provided that it supports the brush adequately and appropriately and it may be attached to an angle adjustment system to enable the rod 33 and thereby the brush 10 to be adjusted and the paintbrush rotation control handle 31 may also have any appropriate size or shape.

CLAIMS

1. A paintbrush rotation control system including a first rotary member (56) having a concave cylindrical surface and a second rotary member (33) located within and substantially coaxial with the first rotary member (56) and having a convex cylindrical surface positioned adjacent to the concave cylindrical surface of the first rotary member (56),

means for attaching one of the rotary members to paintbrush control system handle (31), and means for attaching the other rotary member to the paintbrush (10), whereby if the bristles (25) of the paintbrush (10) are placed in a painting position against a surface (71) with the axis (37) of the brush extending substantially perpendicular to the surface (71) and the paintbrush control system handle (31) is moved with a circular motion about an axis (72) substantially coinciding with the axis (33) of the brush, the cylindrical surfaces of the rotary members (56, 33) will interact to cause the brush (10) to rotate about its axis.

2. A paint brush rotation control system as claimed in Claim 1, in which the first rotary member (56) is attached to the paintbrush (10) and the second rotary member (33) is attached to the control system handle (31), whereby the circular motion of the paintbrush control system handle (31) in a clockwise direction results in the brush (10) rotating about its axis in a clockwise direction.

3. A paintbrush rotation control system substantially as herein described with reference to the accompanying drawings.

Fig 1

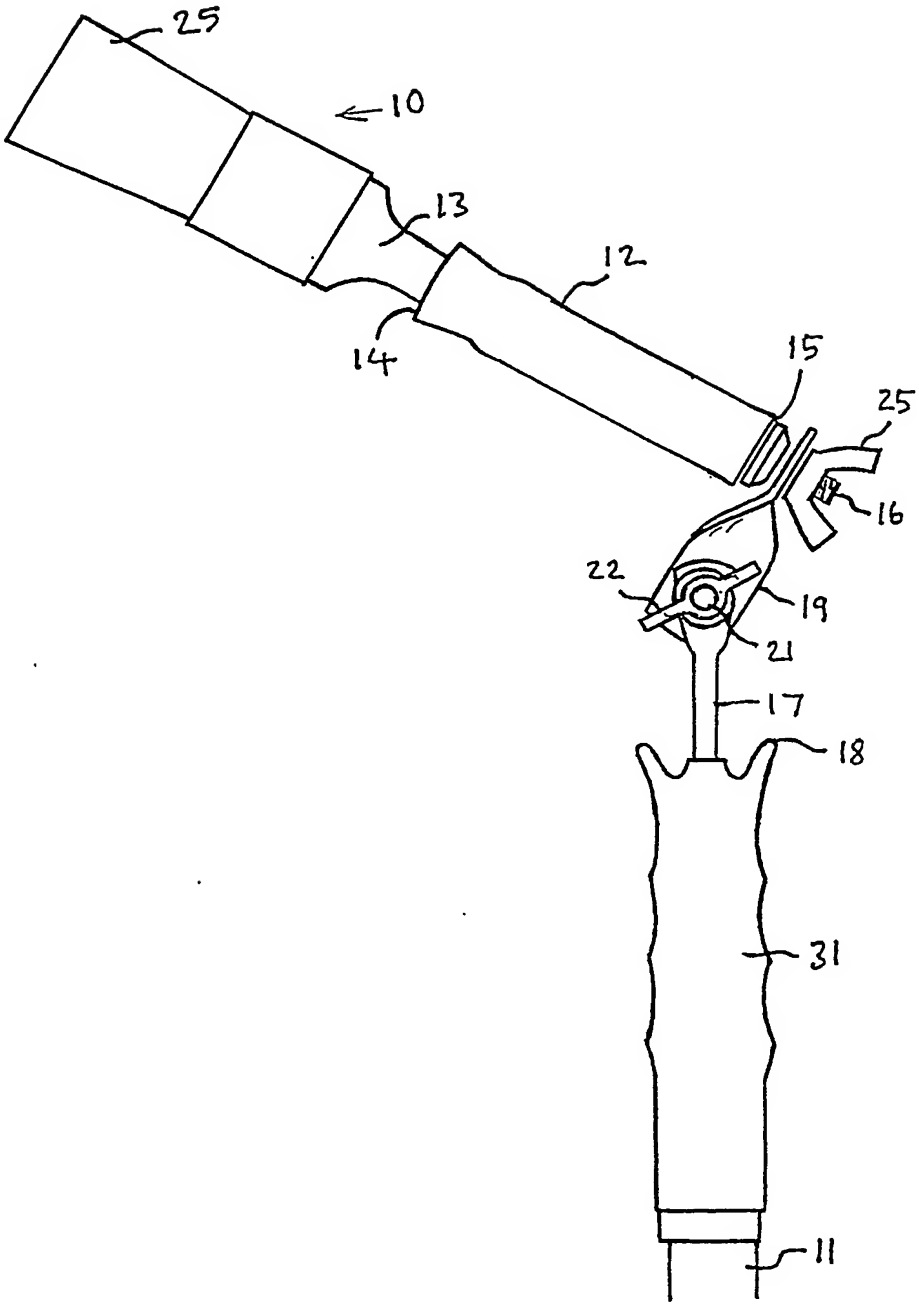


Fig 2

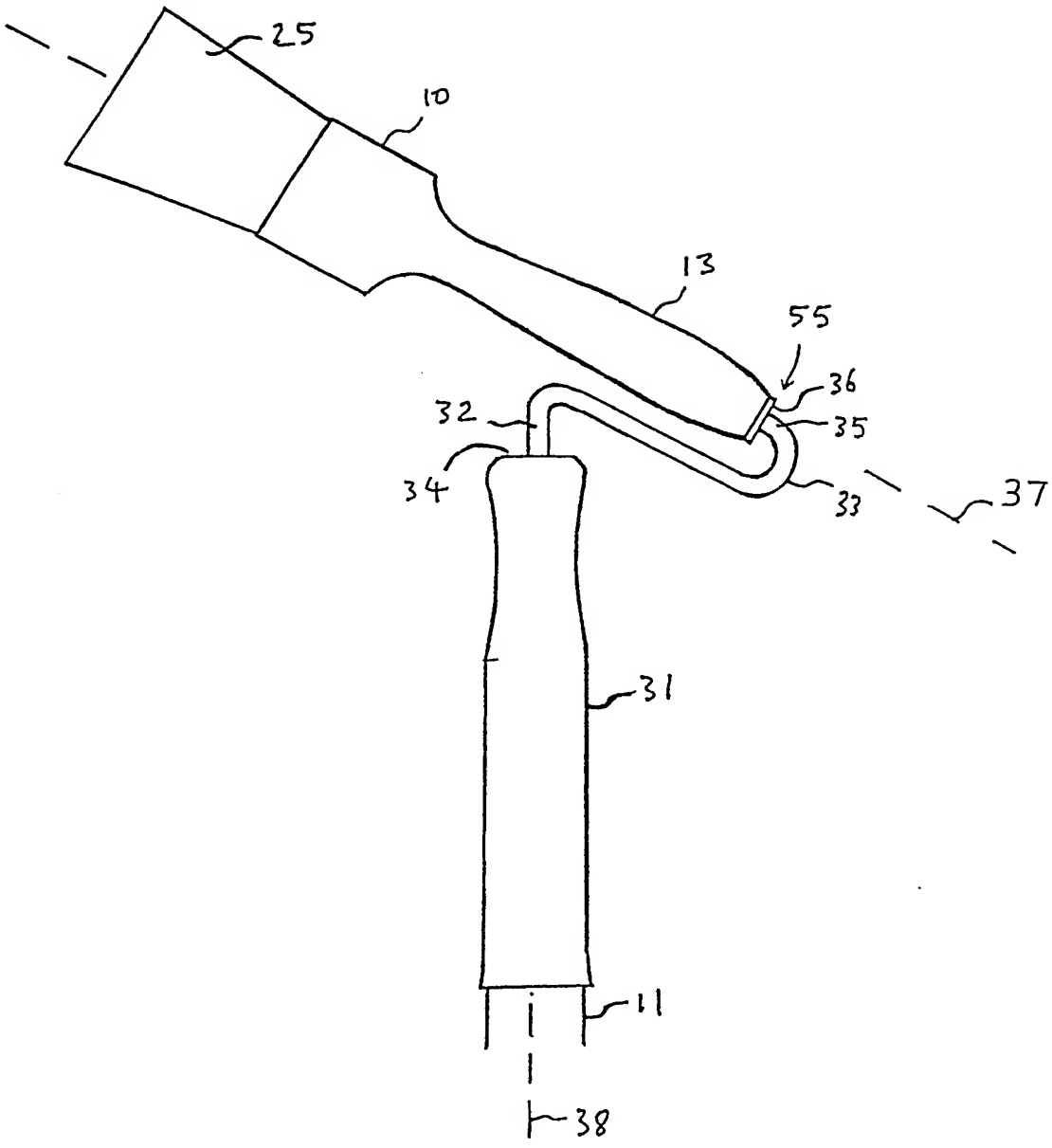


Fig 3

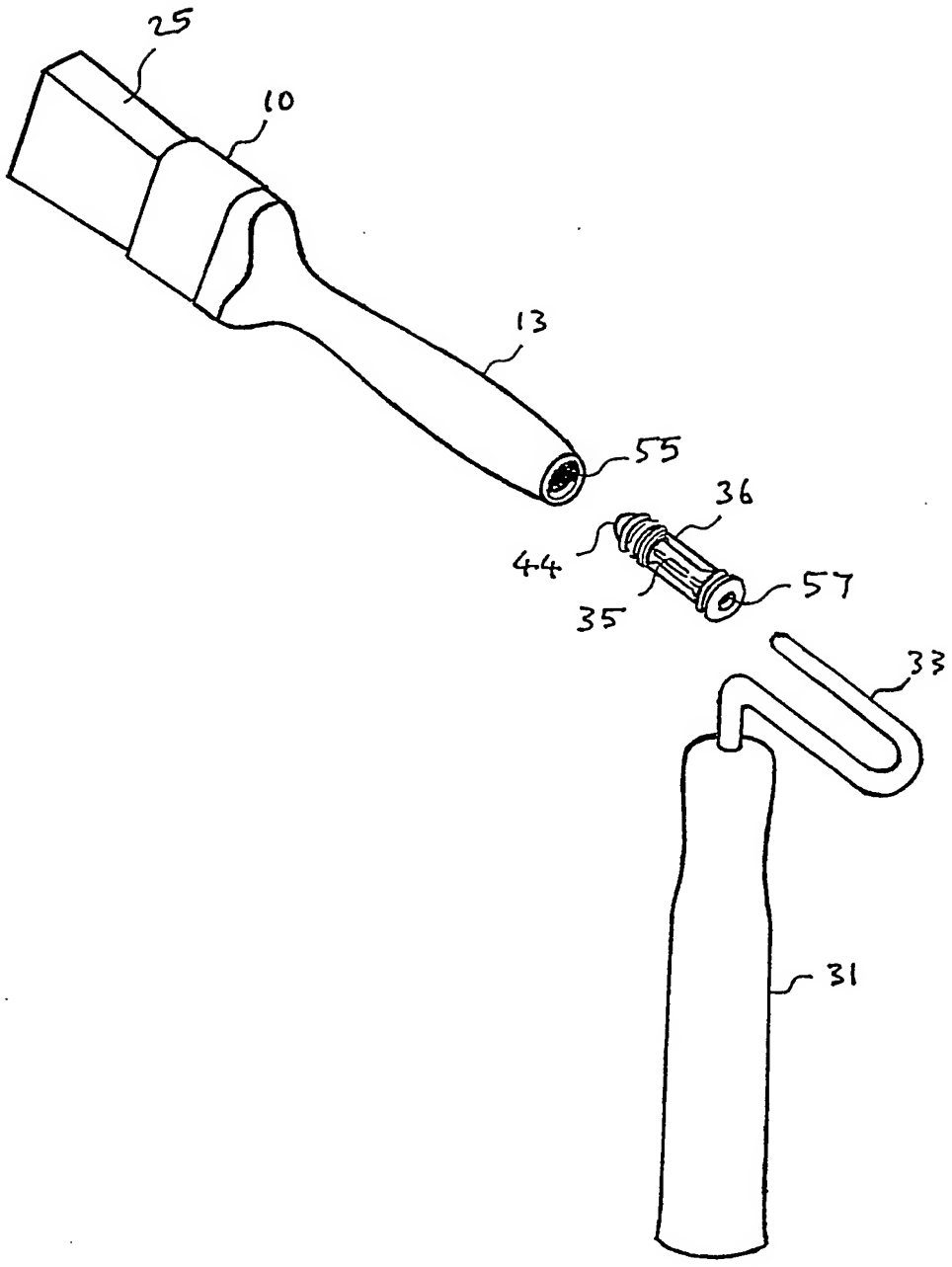


Fig 4

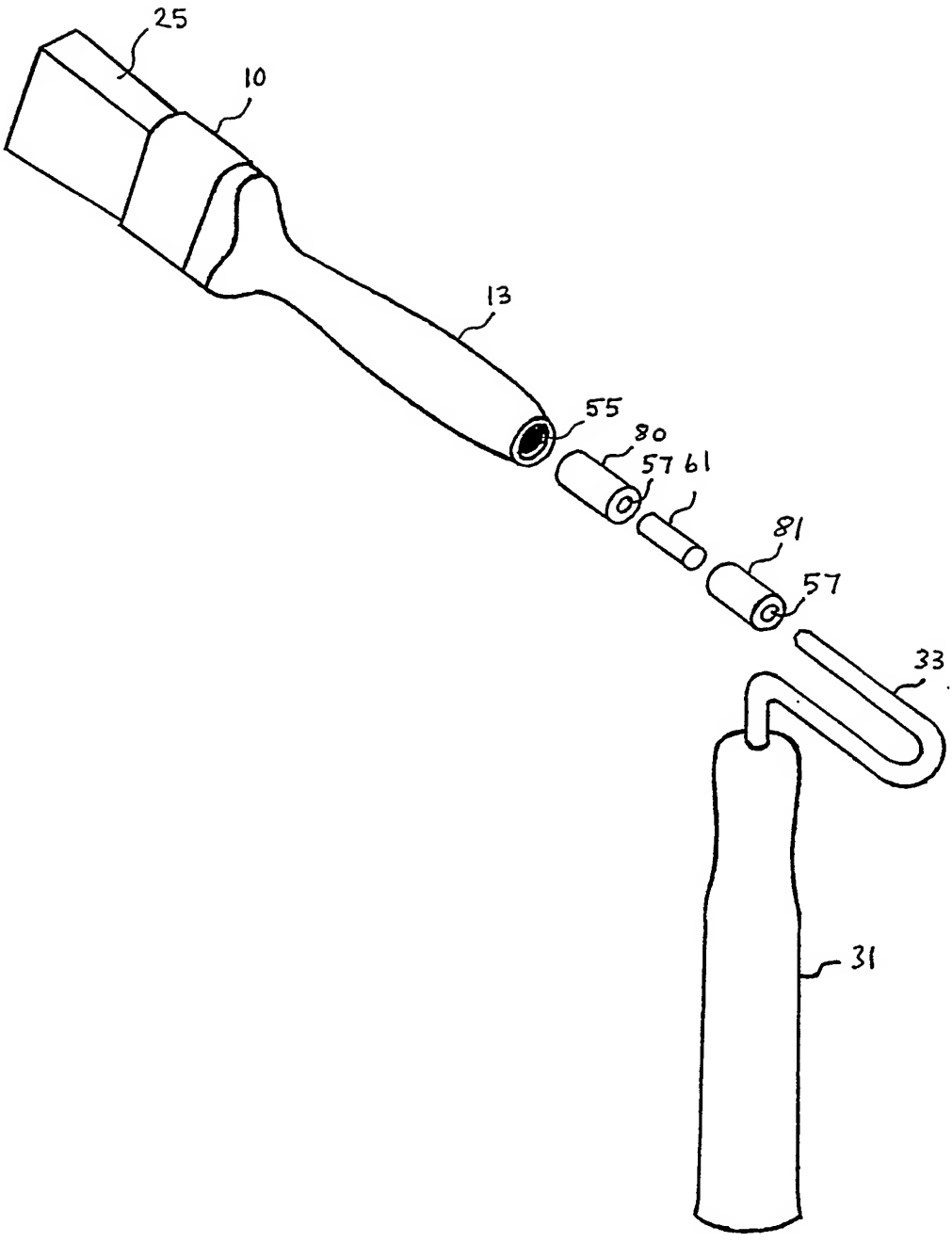


Fig 5

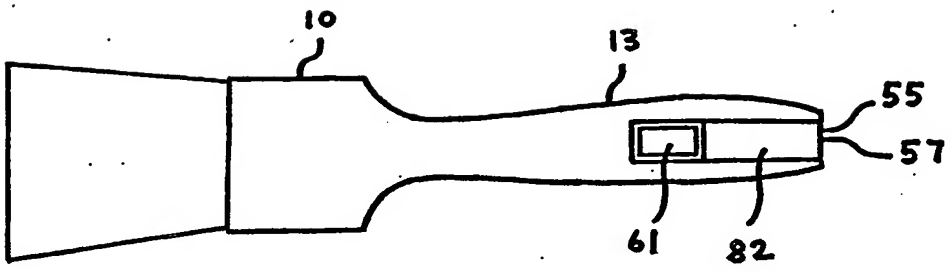


Fig 6

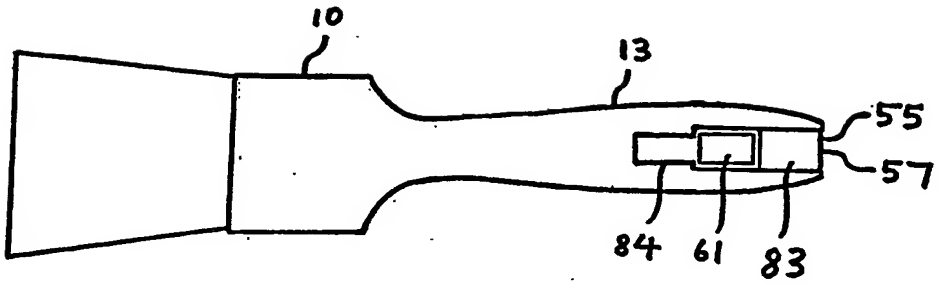


Fig 7

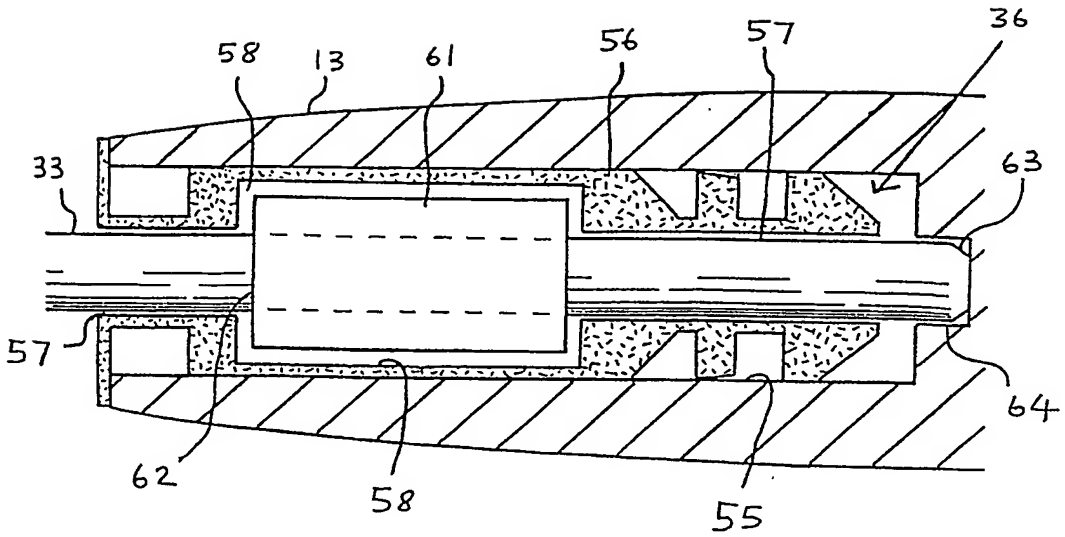


Fig 8

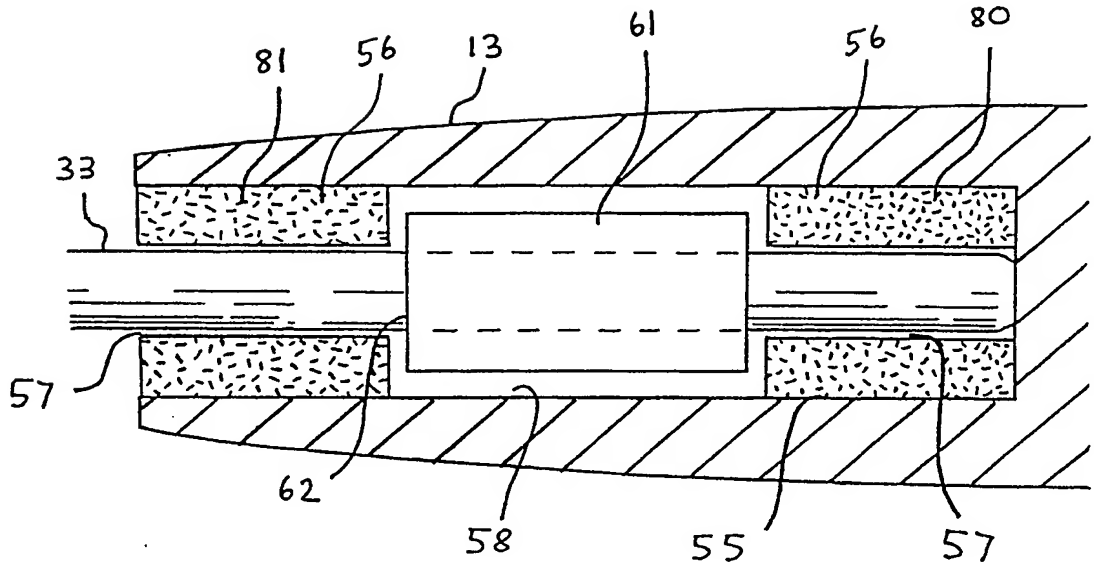


Fig 9

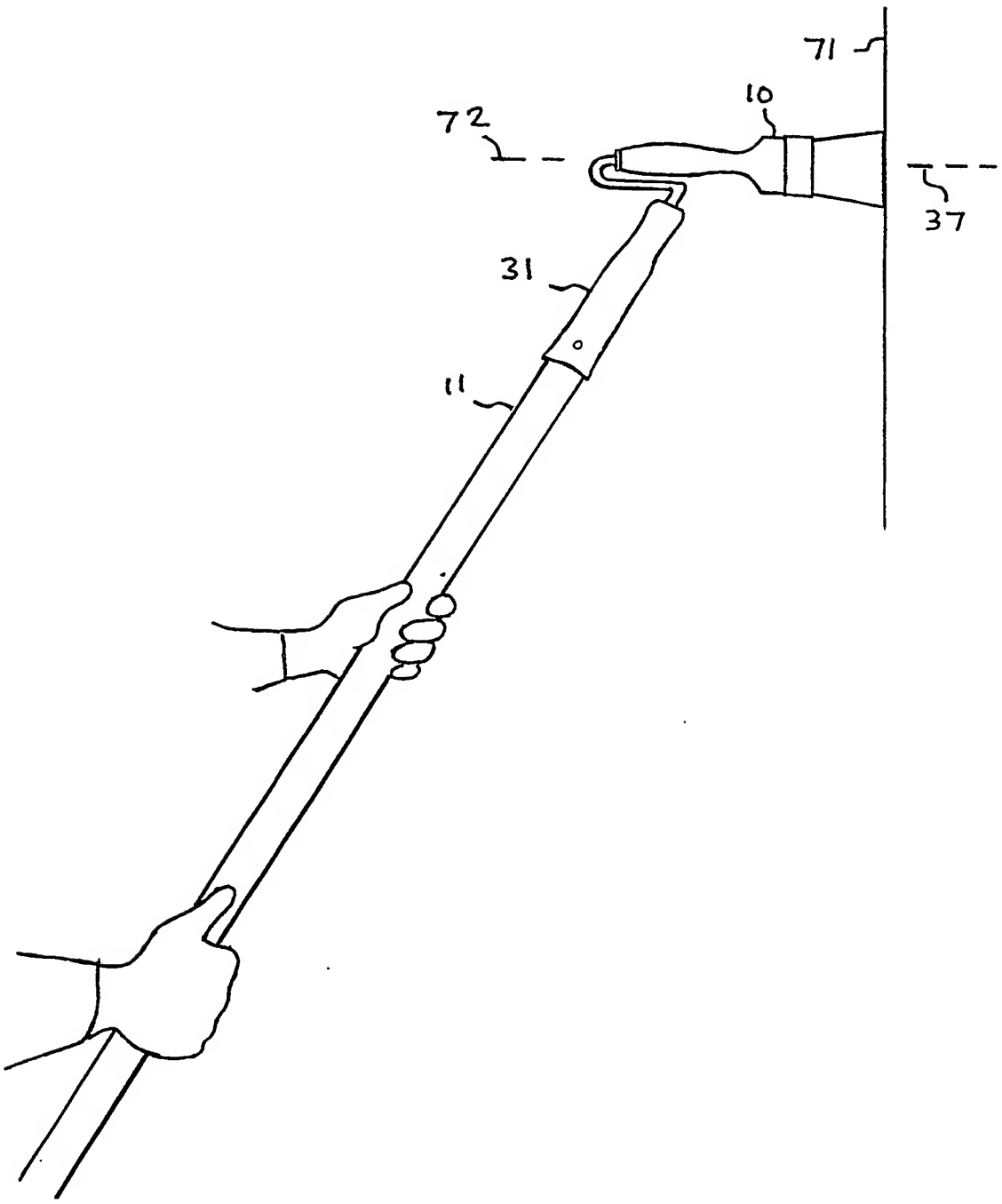
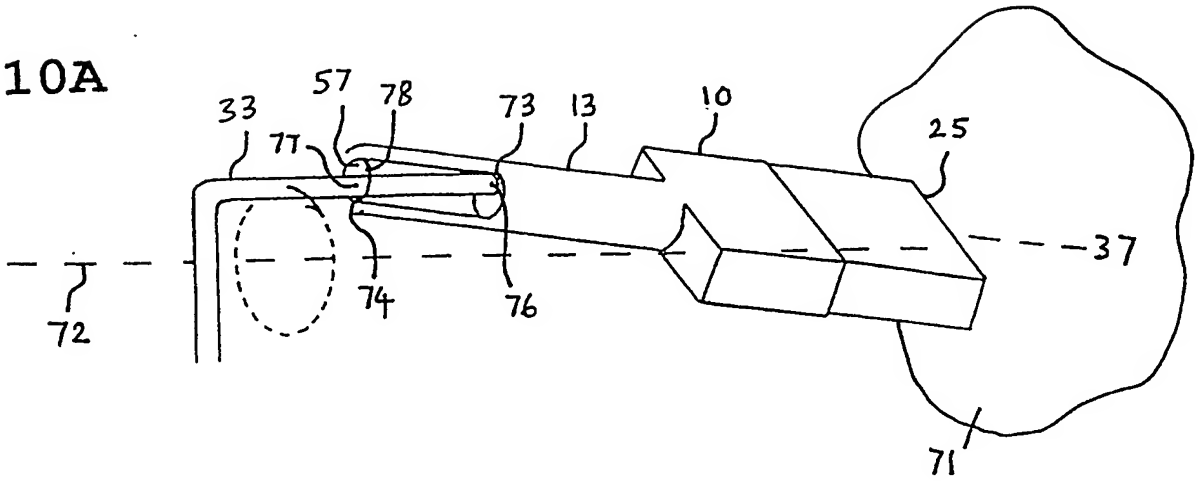
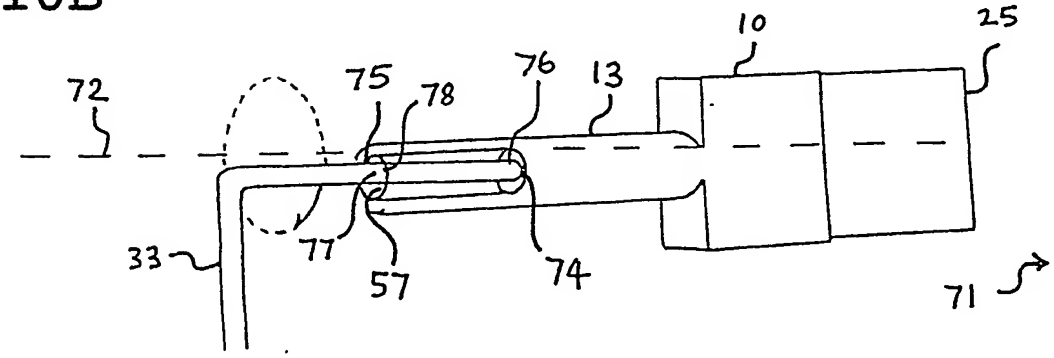


Fig 10

10A



10B



10C

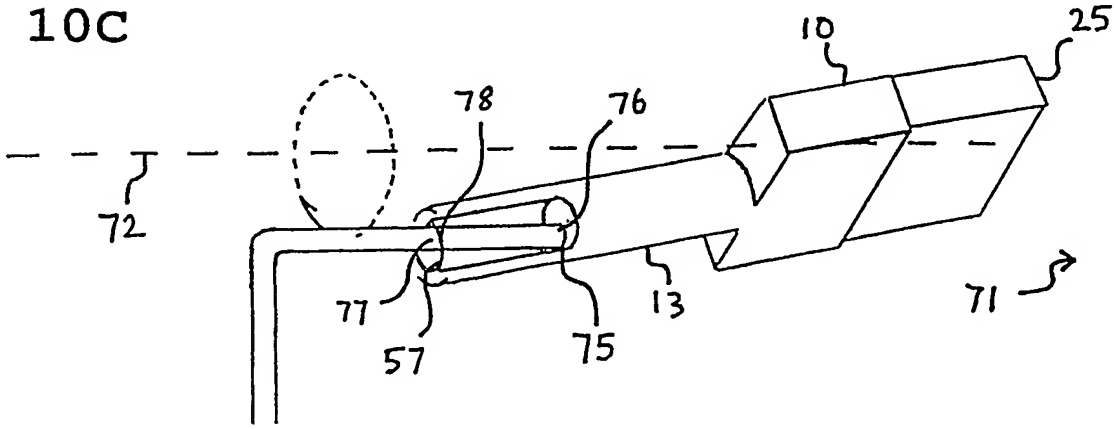
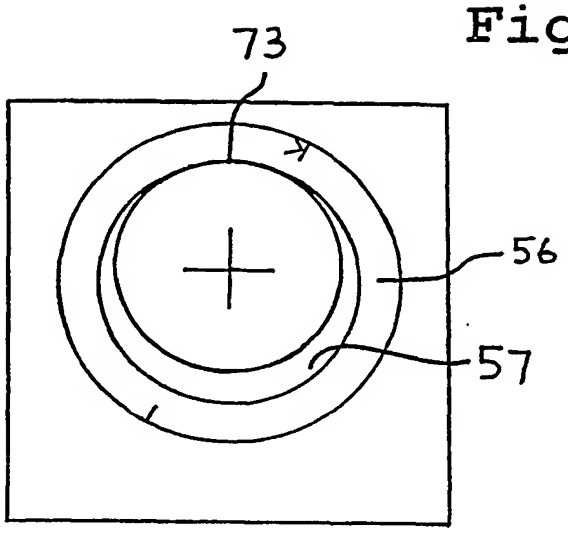
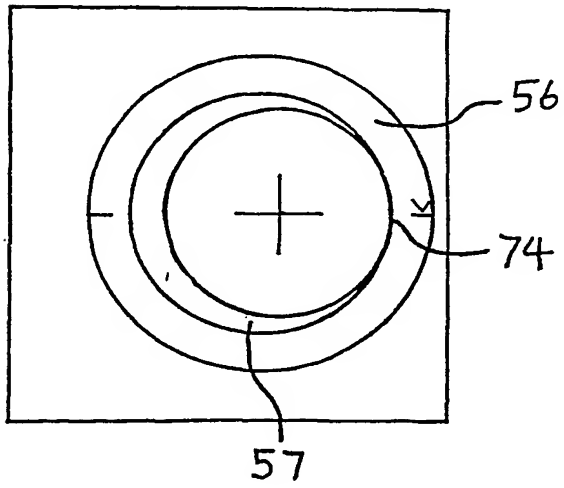


Fig 11

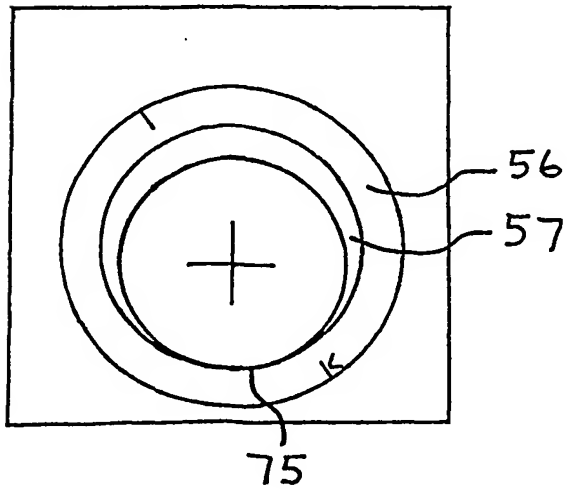
11A



11B



11C



INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 03/01737

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B25G1/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B25G A46B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 502 859 A (KIM WHA J) 2 April 1996 (1996-04-02) figure 5	1-3
X	US 5 802 658 A (WARD KEITH HAROLD) 8 September 1998 (1998-09-08) figure 6	1-3
X	DE 200 04 032 U (LIN CEE) 5 October 2000 (2000-10-05) figure 1	1-3

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
19 September 2003	29/09/2003

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Popma, R

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/GB 03/01737

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 5502859	A	02-04-1996	NONE		
US 5802658	A	08-09-1998	NZ	270586 A	26-08-1998
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